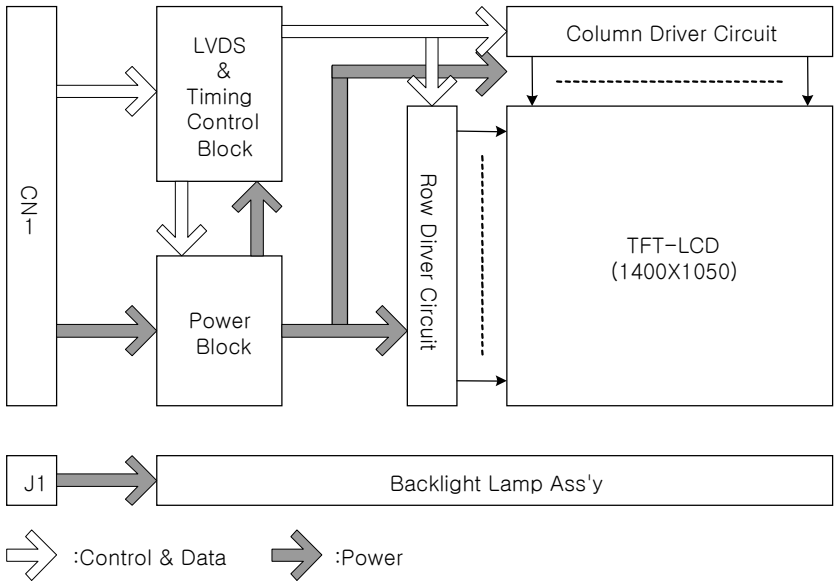
1. General Description

The LP150E02 is a Color Active Matrix Liquid Crystal Display with an integral Cold Cathode Fluorescent Lamp(CCFL) backlight system. The matrix employs a-Si Thin Film Transistor as the active element.
It is a transmissive type display operating in the normally white mode. This TFT-LCD has 15.0 inches diagonally measured active display area with SXGA+ resolution(1050 vertical by 1400 horizontal pixel array)
Each pixel is divided into Red, Green and Blue sub-pixels or dots which are arranged in vertical stripes. Gray scale or the brightness of the sub-pixel color is determined with a 6-bit gray scale signal for each dot, thus, presenting a palette of more than 262,144 colors.

The LP150E02 has been designed to apply the interface method that enables low power, high speed, low EMI.

The LP150E02 is intended to support applications where thin thickness, low power are critical factors and graphic display are important. In combination with the vertical arrangement of the sub-pixels, the LP150E02 characteristics provide an excellent flat display for office automation products such as Notebook PC.



General Features

Active Screen Size	15.0 inches(38.1cm) diagonal
Outline Dimension	317.3(H) x 241.5(V) x 6.0(D) mm(Max.)
Pixel Pitch	0.2175 mm x 0.2175 mm
Pixel Format	1400 horiz. By 1050 vert. Pixels RGB strip arrangement
Color Depth	6-bit, 262,144 colors
Luminance, White	150 cd/m^2(Typ.)
Power Consumption	Total 4.63 Watt(Typ.)
Weight	540 g (typ.)
Display Operating Mode	Transmissive mode, normally white
Surface Treatment	Hard coating(3H) Anti-glare treatment of the front polarizer

2. Electrical Specifications

The LP150E02 requires two power inputs. One is employed to power the LCD electronics and to drive the TFT array and liquid crystal. The second input which powers the CCFL, is typically generated by an inverter. The inverter is an external unit to the LCD.

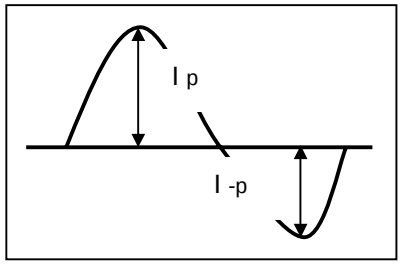
Table 1. ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Values			Unit	Notes
		Min	Typ	Max		
MODULE :						
Power Supply Input Voltage	VCC	3.0	3.3	3.6	Vdc	
Power Supply Input Current	I_{CC}	290	340	390	mA	1
Power Consumption	Pc	0.96	1.13	1.29	Watt	1
Differential Impedance	Zm	90	100	110	ohm	2
LAMP :						
Operating Voltage	V_{BL}	655	685	805	V_{RMS}	3
Operating Current	I_{BL}	3.0	5.0	6.0	mA_{RMS}	
Established Starting Voltage	Vs					4
at 25 °C		-	-	1140	V_{RMS}	
at 0 °C		-	-	1370	V_{RMS}	
Operating Frequency	f_{BL}	45	58	80	kHz	5
Discharge Stabilization Time	Ts	-	-	3	Min	6
Power Consumption	P_{BL}	-	3.5	3.85	Watt	7
Life Time		10,000	-	-	Hrs	8

Note : The design of the inverter must have specifications for the lamp in LCD Assembly**.**
The performance of the Lamp in LCM, for example life time or brightness, is extremely influenced by the characteristics of the DC-AC inverter. So all the parameters of an inverter should be carefully designed so as not to produce too much leakage current from high-voltage output of the inverter. When you design or order the inverter, please make sure unwanted lighting caused by the mismatch of the lamp and the inverter(no lighting, flicker, etc) never occurs. When you confirm it, the LCD – Assembly should be operated in the same condition as installed in you instrument.

1. The specified current and power consumption are under the VCC=3.3V, 25°C, f_V=60Hz condition whereas Mosaic pattern is displayed and f_V is the frame frequency.
2. This impedance value is needed to proper display and measured from LVDS T_X to the mating connector.
3. The variance of the voltage is ± 10%.
4. The voltage above V_S should be applied to the lamps for more than 1 second for start-up. Otherwise, the lamps may not be turned on. The used lamp current is the lamp typical current.

5. The output of the inverter must have symmetrical(negative and positive) voltage waveform and symmetrical current waveform.(Unsymmetrical ratio is less than 10%) Please do not use the inverter which has unsymmetrical voltage and unsymmetrical current and spike wave.
   Lamp frequency may produce interface with horizontal synchronous frequency and as a result this may cause beat on the display. Therefore lamp frequency shall be as away possible from the horizontal synchronous frequency and from its harmonics in order to prevent interference.
6. Let's define the brightness of the lamp after being lighted for 5 minutes as 100%.
   T_S is the time required for the brightness of the center of the lamp to be not less than 95%.
7. The lamp power consumption shown above does not include loss of external inverter.
   The used lamp current is the lamp typical current.
8. The life is determined as the time at which brightness of the lamp is 50% compared to that of initial value at the maximum lamp current($6.0mA_{RMS}$) on condition of continuous operating at 25 ± 2°C
9. Requirements for a system inverter design, which is intended to have a better display performance, a better power efficiency and a more reliable lamp, are following.
   It shall help increase the lamp lifetime and reduce leakage current.
   a. The asymmetry rate of the inverter waveform should be less than 10%.
   b. The distortion rate of the waveform should be within $\sqrt{2}$ ± 10%.
   * Inverter output waveform had better be more similar to ideal sine wave.



* Asymmetry rate:

$| I_p - I_{-p} | / I_{rms} * 100\%$

* Distortion rate

I_p (or I_{-p}) / I_{rms}

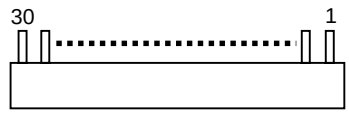
※ Do not attach a conducting tape to lamp connecting wire.
If the lamp wire attach to a conducting tape, TFT-LCD Module has a low luminance and the inverter has abnormal action. Because leakage current is occurred between lamp wire and conducting tape.

3. Interface Connections

The interface connections are compatible with **ISP (Industry Standard Panels) 15.0" Mounting and Top Level Interface Requirements (Version2, June,2000)** defined by **SPWG (Standard Panels Working Group).** This LCD employs two interface connections, a 30 pin connector is used for the module electronics and the other connector is used for the integral backlight system.
The electronics interface connector is a model GT101-30S-HR11 manufactured by LG Cable. The pin configuration for the connector is shown in the table below.

Table 2. MODULE CONNECTOR PIN CONFIGURATION (CN1)

Pin	Symbol	Description	Notes
1	VSS	Ground	
2	VCC	Power Supply, 3.3V Typ.	[LVDS Transmitter]
3	VCC	Power Supply, 3.3V Typ.	Thine, THC63LVDF823A or equivalent
4	V_{EDID}	DDC 3.3V power	
5	NC	No Connection	[LVDS Receiver]
6	Clk_{EDID}	DDC Clock	Thine, THC63LVDF824A
7	$DATA_{EDID}$	DDC Data	
8	Odd_R_{IN}0-	-LVDS differential data (odd pixels R0-R5, G0)	[Connector]
9	Odd_R_{IN}0+	+LVDS differential data (odd pixels R0-R5, G0)	LCD : GT101-30S-HR11, LG Cable
10	VSS	Ground	*** JAE FI-XB30Sx-HFxx or**
11	Odd_R_{IN}1-	-LVDS differential data (odd pixels G1-G5, B0-B1)	**JAE FI-XB30S-HF or equivalent.**
12	Odd_R_{IN}1+	+LVDS differential data (odd pixels G1-G5, B0-B1)	Matching : JAE FI-X30M or
13	VSS	Ground	equivalent
14	Odd_R_{IN}2-	-LVDS differential data (odd pixels B2-B5, HS, VS, DE)	
15	Odd_R_{IN}2+	+LVDS differential data (odd pixels B2-B5, HS, VS, DE)	
16	VSS	Ground	
17	Odd_Clk_{IN}-	-LVDS differential clock (odd pixels)	[Connector pin arrangement]
18	Odd_Clk_{IN}+	+LVDS differential clock(odd pixels)	
19	VSS	Ground	
20	Even_R_{IN}0-	-LVDS differential data (even pixels R0-R5, G0)	
21	Even_R_{IN}0+	+LVDS differential data (even pixels R0-R5, G0)	
22	VSS	Ground	
23	Even_R_{IN}1-	-LVDS differential data (even pixels G1-G5, B0-B1)	
24	Even_R_{IN}1+	+LVDS differential data (even pixels G1-G5, B0-B1)	
25	VSS	Ground	
26	Even_R_{IN}2-	-LVDS differential data (even pixels B2-B5, HS, VS, DE)	
27	Even_R_{IN}2+	+LVDS differential data (even pixels B2-B5, HS, VS, DE)	
28	VSS	Ground	
29	Even_Clk_{IN}-	-LVDS differential clock (even pixels)	
30	Even_Clk_{IN}+	+LVDS differential clock (even pixels)	



LCD rear view

Note: All GND(ground) pins should be connected together and to GND which should also be connected to the LCD's metal frame. All VCC (power input) pins should be connected together.

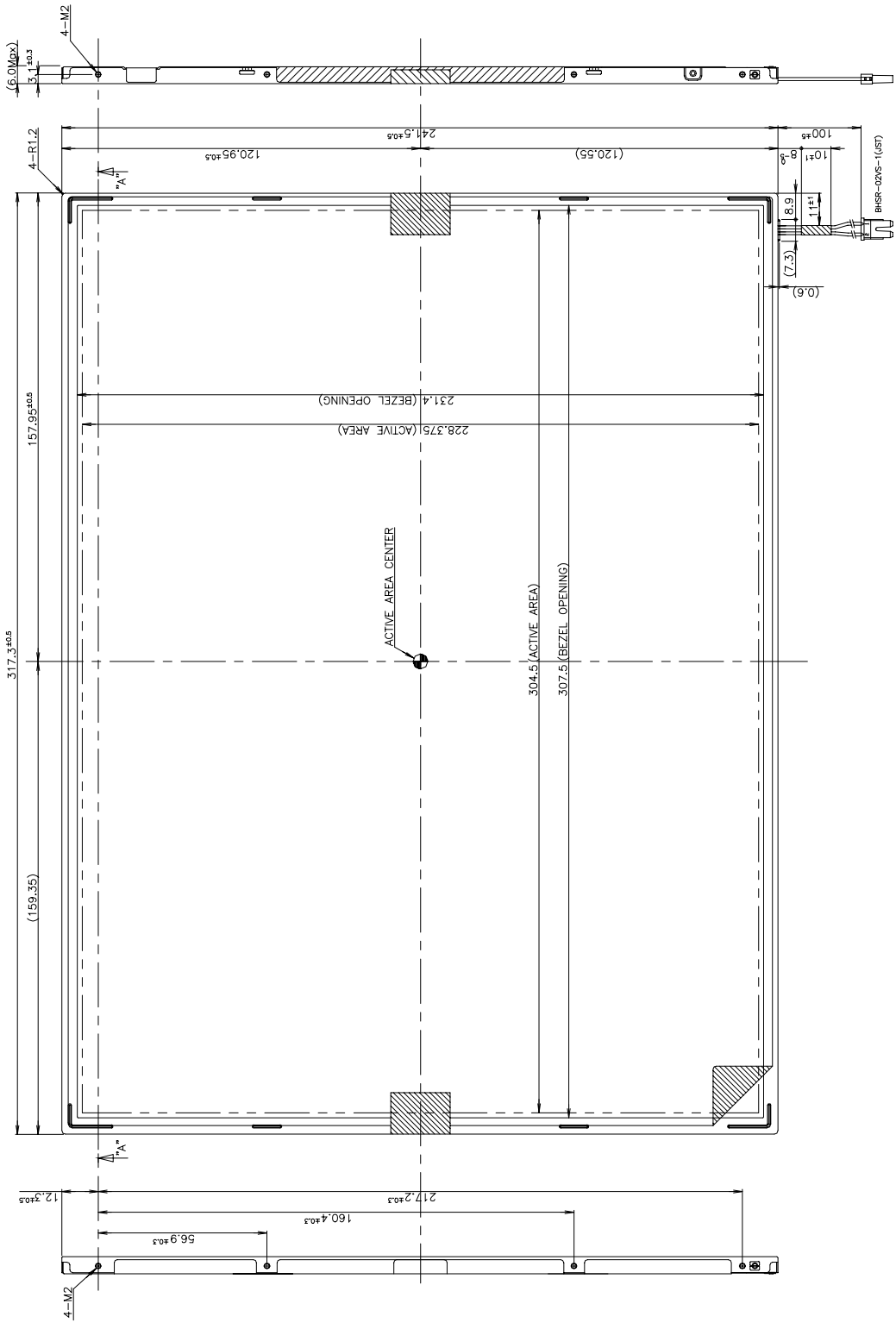
The backlight interface connector is a model BHSR-02VS-1, manufactured by JST. The mating connector part number is SM02B-BHSS-1 or equivalent.

Table 3. BACKLIGHT CONNECTOR PIN CONFIGURATION (J1)

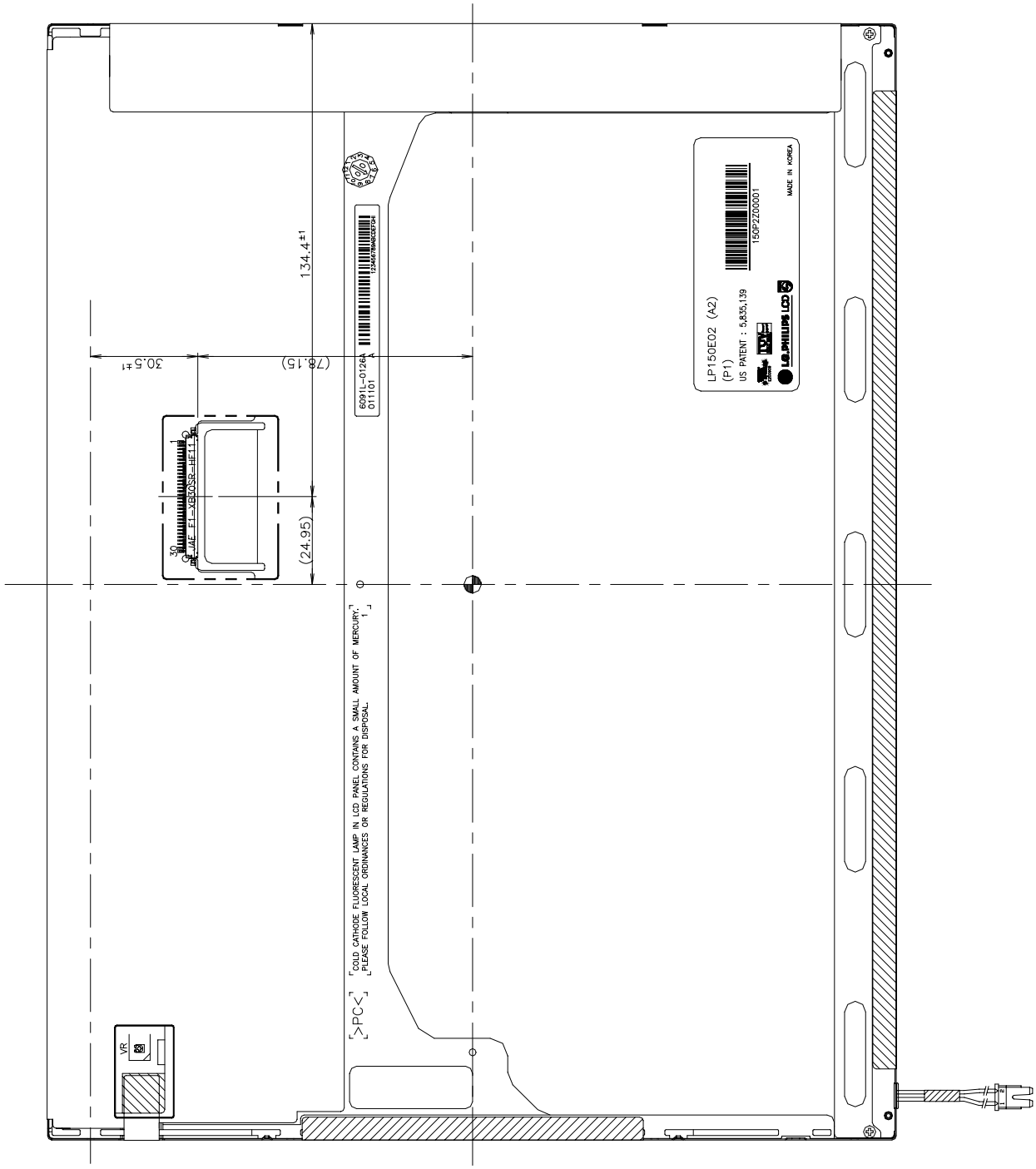
Pin	Symbol	Description	Notes
1	HV	Power supply for lamp (High voltage side)	1
2	LV	Power supply for lamp (Low voltage side)	1

Notes : 1. The high voltage side terminal is colored pink and the low voltage side terminal is yellow

<FRONT VIEW>


4-M2
(6.0Max)
3.1±0.3
4-R1.2
"A"
241.5±0.5
120.95±0.5
(120.55)
100±0.5
10±1
8
8.9
1.1±1
BHSR-02VS-1(JST)
(7.3)
(0.6)
231.4 (BEZEL OPENING)
228.375 (ACTIVE AREA)
157.95±0.5
317.3±0.5
ACTIVE AREA CENTER
304.5 (ACTIVE AREA)
307.5 (BEZEL OPENING)
(159.35)
12.3±0.5
217.2±0.3
160.4±0.5
56.9±0.5
4-M2

<REAR VIEW>


134.4±1
(78.15)
30.5±1
(24.95)
LP150E02 (A2)
(P1)
US PATENT : 5,835,139
150P2Z00001
MADE IN KOREA
60911-0126A
011101
"COLD CATHODE FLUORESCENT LAMP IN LCD PANEL CONTAINS A SMALL AMOUNT OF MERCURY."
"PLEASE FOLLOW LOCAL ORDINANCES OR REGULATIONS FOR DISPOSAL"
">PC<"
VR

4. PRECAUTIONS

The LCD Products listed on this documents are not suitable for use of Military, Industry, Medical etc. System.
If customers intend to use these LCD products for above application, Please contact our sales people In advance.